Device for winding an elongate, threadlike element on a winding element.

DESCRIPTION

The invention relates to a device for winding an element built up of at least one elongate, threadlike strand on a winding element, said device comprising a frame provided with at least: an inlet for the elongate, threadlike element, and a winding element to be rotatably driven about a winding shaft, said device furthermore comprising drive means at least for rotatably driving the winding element.

In the fibre or yarn industry, the fibre or the yarn (or generally an elongate, threadlike element) is wound on a winding element, such as a bobbin, for further processing. The elongate, threadlike element may be composed of one or more strands. In specific applications, for example in the manufacture of single-string synthetic fibres by means of an extrusion process, which fibres are used in the construction of a sports field of artificial grass, it is desirable to unwind the fibre and twist it about its longitudinal axis.

In the case of a single-strand elongate, threadlike element, this technique is called "twisting". After said "twisting", the single-strand fibre is wound on a winding element again. A multi-strand elongate, threadlike element can likewise be twisted about its longitudinal axis. This technique is called "twining".

It should be noted, therefore, that the device disclosed in the present application is suitable for handling single-strand as well as multi- (more than one) strand, elongate, threadlike elements.

Such a method of producing a twisted or twined elongate, threadlike element is labourious, not only because of the additional operations that are required, but also because of the additional production time required for the twisting/twining step after the winding

step. Furthermore, the winding element, on which the synthetic fibre wound in many windings, must be manually removed from the winding device and be placed into a separate twisting or twining device. This latter operation takes time, and because of the additional manual operations that are required, it is not attractive both for economic reasons and for ergonomic reasons.

The object of the invention is to provide a device as referred to in the introduction that does not exhibit the above drawbacks. According to the invention, the winding device is characterized in that twisting means are mounted in the frame, which twisting means impart one or more turns per unit length to the elongate, threadlike element before said elongate, threadlike element is wound on the winding element.

For a correct understanding of the device according to the invention, it should be noted once again that the term "turns" means "twists" (in the case of a single-strand elongate, threadlike element) or "twines" (in the case of a multi-string elongate, threadlike element).

By subjecting an elongate, threadlike element (such as a fibre or a yarn) to a twisting or twining operation before winding it, a number of additional operating steps are skipped. Not only does this shorten the production process of the fibre or the arm, but it also reduces the cost of the process. The latter respect is further enhanced in that all kinds of additional, ergonomically less attractive manual operations do not need to be carried out.

Furthermore, a more compact construction is obtained by using the winding device according to the invention, because a separate twisting or twining device is no longer required.

The compact but very functional construction of the winding device according to the invention is further improved in that the twisting means comprise a twisting shaft to be rotatably driven by the drive means, which twisting shaft is mounted in bearings in the frame, in

such a manner that a first end of the twisting shaft is located within the frame and the other, second end of the twisting shaft is located outside the frame. The drive means may at least partially be disposed outside the frame and drive the second end of the twisting shaft rotatably. This latter aspect ensures that the winding device is easy to operate (read: drive). The twisting means are readily accessible in the frame, for example for maintenance purposes, whilst parts forming part of the fixed structure, such as the drive means, do not interfere with an optimum twisting or twining operation of the twisting means.

In a specific embodiment, the winding element can be mounted in bearings on the winding shaft, and the winding shaft is connected to the first end of the twisting shaft via bearings. In a specific embodiment, the winding shaft is in line with the twisting shaft. The above aspects ensure a mechanical freewheel or disconnection between the winding element and the winding shaft on the one hand and between the winding shaft and the twisting shaft on the other hand. This guarantees that the winding shaft is freely journalled in the frame, functioning as a semi-fixed structure, which latter aspect on the one hand leads to a compact construction, whilst this driving arrangement on the other hand makes it possible to use one and the same drive unit for driving said shafts.

In a very specific embodiment, by means of which any number of turns (twists or twines) per unit length can be imparted to the elongate, threadlike element in a very efficient manner, the winding device according to the invention is characterized in that the twisting means furthermore comprise at least one radially extending twisting arm mounted on the first end of the twisting shaft, which twisting arm is provided with a feed-through channel for the elongate, threadlike element, which extends from the free end of the twisting arm to the twisting shaft. The twisting arm may be provided with a guide eye at its free end, which guide eye connects to a feed-through channel.

More in particular, the feed-through channel is a slot or a bore formed in the surface of the twisting arm, whilst furthermore the guide eye and/or the feed-through channel are provided with a material having an enhanced hardness. More specifically, the guide eye and/or the feed-through channel are provided with ceramic guide surfaces. On the one hand these aspects prevent wear on the moving parts of the winding device according to the invention, whilst on the other hand they help realise an improved control of the yarn tension of the elongate, threadlike element, this in order to prevent yarn fracture.

In a specific embodiment, in order to obtain an improved stability of the twisting arm during its rotation about the twisting shaft, the twisting arm is provided with a counterweight at the other end of the twisting shaft, seen in the longitudinal direction of the twisting arm.

According to an additional aspect, the twisting means by which additional turns (twists or twines) per unit length can be effectively imparted to the elongate, threadlike element, are characterized in that the twisting shaft is provided with a longitudinal bore, which bore connects to the feed-through formed in the arm on the one hand and to a winding bore formed in the winding shaft on the other hand.

In a specific embodiment, the bore may be right-angled near the connection to the feed-through channel formed in the twisting arm, in which case also the winding bore may be right-angled. These aspects guarantee a smooth transport of the elongate, threadlike element from the twisting arm through the bore in the twisting shaft in the direction of the winding shaft and the winding element present on the winding shaft without the risk of inadmissible increases in the yarn tension that might lead to yarn fracture.

According to the invention, in order to further reduce the occurrence of yarn fracture caused by abrasion, the bore in the twisting

shaft is provided with friction-reducing means, which means may comprise one or more ceramic guide surfaces in the bore.

A specific embodiment, which provides a compact, lightweight but in particular very functional design of the present invention, is characterized in that the winding shaft is provided with a support, on which the drive means for the winding element are placed. The support may consist of a first supporting shaft, which is connected to the winding shaft, and a second supporting shaft, which is pivotally connected to the first supporting shaft.

In a very simple yet reliable design of the drive means for the winding element, the drive means comprise a driving roller which is rotatably mounted to the second supporting arm and which can be placed into abutment with the winding element. As already said before, this manner of driving the winding element for the purpose of winding the twisted twined elongate, threadlike element not only provides a construction which is not only compact but also inexpensive.

According to the invention, it is ensured that the elongate, threadlike element is accurately wound on the winding element in that the driving roller can be placed into abutment with the winding element with an adjustable, constant force by power means, which power means may comprise a gas spring or a tension spring.

According to the invention, in order to ensure an adequate distribution of the windings of the elongate, threadlike element over the entire length of the winding element, a rotatably driven guide roller extending parallel to the driving roller is mounted on the second supporting arm, which guide roller is provided with winding grooves extending over the circumferential surface thereof for carrying the elongate, threadlike element to the winding element.

More in particular, a guide element extending parallel to the guide roller may be provided on the second supporting arm, over which guide element the elongate, threadlike element can be carried in the

direction of the guide roller. Possible blockage or other transport problem of the elongate, threadlike element through the winding device is prevented in this way. The guide roller ensures a very uniform distribution of the windings over the winding element.

In a specific embodiment, the first end of the twisting shaft is provided with circumferential teeth for driving the winding element via the driving roller, which teeth rotatably drive the driving roller and the guide roller via one or more gear transmissions upon rotation of the twisting shaft. This specific driving construction provides a winding device whose winding and twisting means are mounted in the frame completely clear of the fixed structure and the drive means, which enables a much more efficient operation of the winding device.

Furthermore, these aspects lead to a compact construction, using only one drive means, which, as already noted above, is disposed outside the frame and drives the second end of the twisting shaft via a suitable belt or chain transmission, and which, on account of the specific bore construction that is used, enables twisting of the yarn via the twisting shaft and the gear transmissions. This, too, leads to a robust and maintenance-free construction.

In order to ensure a smooth transport of the yarn or the fibre in the device from the twisting shaft to the winding element, the support is according to the invention provided with one or more guide wheels for guiding the elongate, threadlike element from the winding bore to the winding element via the guide element and the guide roller.

According to the invention, in order to prevent jamming of the device caused by the introduction of the elongate, threadlike element into the frame and thus prevent yarn blockage or fracture, guide means are provided on the support, which guide means extend in radial direction, beyond the free end of the winding shaft, for carrying the elongate, threadlike element arriving from the inlet, over the winding element, towards the twisting arm.

The winding device according to the invention leads to a significant simplification of the production process of, for example, synthetic yarns. The device can be directly incorporated in the production line (directly behind the yarn-producing device, such as an extruder), as a result of which twisting and winding of the yarn exiting the yarn-producing device can take place directly. The yarn tension is easy to control by means of the twisting arm and the brake means on the inlet side, for example in case of yarn fracture. This, too, leads to a small-sized winding device.

The invention will now be explained in more detail with reference to a drawing, in which:

Fig. 1 is a cut-away view of an embodiment of a winding device according to the invention;

Fig. 2 is a detail view of an embodiment of a winding device according to the invention;

Figs. 3a-3f show various views of the embodiment that is shown in Fig. 2;

Fig. 4 shows a specific component of the winding device according to the invention;

Figs. 5a-5b show further cross-sectional views of the embodiment of a winding device according to the invention;

Fig. 6 shows another aspect of the winding device according to the invention;

Figs. 7a-7b show further aspects of the winding device according to the invention; and

Fig. 8 shows another cross-sectional view of an embodiment of a winding device according to the invention.

In the description below, identical parts will be indicated by the same numerals.

Fig. 1 shows a general view of an embodiment of a winding device according to the invention. The device 1 is built up of a frame 10

constructed of several vertical and horizontal members. All the specific parts of the winding device according to the invention are arranged round a shaft 7, which is mounted in bearings in a supporting girder 10a of the frame 10, in such a manner that a first end 7a of the shaft 7 (not shown) extends into the interior of the frame 10, whilst the other, second end 7b of the shaft 7 extends outside the frame, as is shown in Fig. 1. The second end 7b of the shaft 7 is configured as a pulley, over which an endless carrier, for example a V-belt, can be passed, which endless carrier is passed over a driving shaft of the drive means 2. The drive means 2, which may be an electric motor, for example, is connected to a fixed structure outside the frame 10 and imparts a rotary motion to the shaft 7 during operation of the winding device according to the invention.

Furthermore, a winding shaft 6 is mounted in the frame 10, on which winding shaft 6 a winding element 5 can be mounted. An elongate, threadlike element (for example a yarn or a synthetic fibre) is to be wound on the winding element 5 in a large number of windings 8.

The elongate, threadlike element (fibre or yarn) is introduced into the device 1 via an inlet opening 3. The inlet opening 3 is formed in supporting beams 4a-4b, which supporting beams are pivot-mounted in the frame 10. This makes it possible to swing the supporting beams 4a provided with the supply opening 3 aside so as to provide better access to the interior of the frame 10 and the parts disposed therein for maintenance or repairs or for exchanging the winding element 5 with the elongate, threadlike element 8 that is wound thereon.

Fig. 2 is a more detailed view of the winding device according to the invention and of the relevant parts thereof. In Figs. 3a-3f, the construction of the winding device is shown from several different angles. A part of the winding device according to the invention that is known per se is the winding shaft 6 (Figs. 3a-3c), on which a winding element 5 can be mounted in bearings. The winding element 5 is

freely rotatable about the winding shaft 6, therefore.

To ensure that the winding element 5 is securely mounted/retained on the winding shaft 6, the free end 6b of the winding shaft 6 is secured by means of a nut or a shackle pin, which prevents the winding element 5 from running off the shaft.

The essential element of the invention is the possibility to impart one or more turns (twists or twines) per unit length to the elongate, threadlike element before the elongate, threadlike element 8 is wound on the winding element 5. According to the invention, the winding device is provided with twisting means which impart one or more turns ("twists" in the case of a single-strand elongate, threadlike element, or "twines" in the case of a multi-strand elongate, threadlike element) to the elongate, threadlike element 8 (synthetic fibre or yarn) before it is wound on the winding element 5.

The essential element of the twisting means is the twisting shaft 7 as already shown in Figs. 1 and 2, the free end 7b of which shaft is rotated by drive means, for example an electric motor, via a belt or pulley transmission. A freewheel coupling 7c may be arranged between the twisting shaft 7 and the belt pulley 7b.

The twisting shaft 7 is mounted in bearings in the girder 10a of the frame 10 (see Fig. 1), in such a manner that the end 7a of the twisting shaft 7 extends into the frame 10. A twisting arm 11 is mounted to the first end 7a of the twisting shaft 7, which twisting arm extends radially from the twisting shaft 7. The twisting arm 11 comprises a free end 11a and a plate member 11b, which functions as a counterweight.

Since the twisting shaft 7 is mounted in bearings in the frame 10, the twisting shaft 7 will rotate when driven by the drive means 2, as will the radially extending twisting arm 11. During operation, the twisting arm 11 describes a circular motion with the twisting shaft 7 as its centre, with the free end 11a of the twisting arm 11 describing a circle having a radius at least equal to, but preferably larger than the

maximum radius that the windings 8 of the elongate, threadlike element may reach upon being wound on the winding element 5.

To impart the turns (twists or twines) to the elongate, threadlike element, the threadlike element is introduced into the frame 10 via the inlet opening 3 (see Fig. 1) and carried in the direction of the free end 11a of the twisting arm 11. As is shown in more detail in Fig. 4, the free end 11a is provided with a guide eye 12. Furthermore, the twisting arm 11 is provided with a feed-through channel 13, which feed-through channel 13 extends in longitudinal direction from the guide opening 12 towards the position at which the twisting arm 11 is mounted on the first end 7a of the twisting shaft 7.

The elongate, threadlike element that is introduced via the inlet opening is carried through the frame 10 and over the winding shaft 6/the winding element 5, through the guide opening 12, and further in the direction of the twisting shaft 7 via the feed-through channel 13. During operation, the twisting arm 11 undergoes a circular motion, which motion causes the elongate, threadlike element being carried through the inlet opening 3 and the guide opening 12 to be flung round the winding shaft 6.

To prevent the thus created balloon of the elongate, threadlike element from catching behind various parts, with the attendant risk of yarn fracture, guide means 38a-38b are provided in the frame 10. The guide means 38 (38b, see Fig. 3f) are arranged between the inlet opening 3 and the winding shaft 6, extending in radial direction beyond the free end 6b of the winding shaft 6, therefore. In this embodiment, the guide means 38a-38b are configured as a circular tube having a radius which is much larger than the maximum radius that the winding element 5 with the windings 8 can reach. More specifically, the external radius of the guide ring 38a-38b at least equals the length of the twisting arm 11, seen in radial direction.

During the rotary motion that the twisting arm 11 undergoes together with the twisting shaft 7, the elongate, threadlike element is

pulled over the guide ring 38a, so that jamming of the device and possible yarn fracture is prevented.

Fig. 3f shows another embodiment of a winding device according to the invention, in which two guide rings 38a-38b are used instead of one guide ring 38a, by means of which guide rings the creation of balloons in the elongate, threadlike element and jamming of the device and possible thread fracture are avoided.

As Figs. 5a-5b show, the threadlike element being carried through the feed-through channel 13 of the twisting arm 11 via the guide opening 12 is carried through a bore 32 formed in the twisting shaft 7. To facilitate the passage from the vertically oriented feed-through channel 13 (on the twisting arm 11) to the horizontally extending bore 32 in the first end 7a of the twisting shaft 7, the bore 32 connects to the feed-through channel 13 via a right-angled portion 32a.

As is clearly shown in Figs. 5a and 5b, the first end 7a is freely rotatably connected to the semi-fixed structure by means of bearings 29, which semi-fixed structure is represented by the flange 35 of the winding element 6 and the support 18 (yet to be explained) comprising the supporting arms 18a and 18b.

As a result of this construction, the winding shaft 6 is freely rotatable in the frame 10 with respect to the twisting shaft 7.

As is clearly shown in Fig. 5a, the flange 35 of the winding shaft 6 is likewise provided with a bore 32, which connects to the bore 32 at the location indicated at 32b. The bore 32 in the winding shaft 6 likewise exhibits a right angle, so that the bore 33 opens into the outlet opening 34, which outlet opening 34 is formed in the outer surface of the flange 35 of the winding shaft 6. Since the winding shaft 6, the flange 35 and the support 18, 18a-18b are stationary (semi-fixed structure) with respect to the rotating twisting shaft 7, additional turns (twists or twines) can be imparted to the elongate, threadlike element that is being carried through the bore 32. The elongate,

threadlike element exiting from the outlet opening 34 now comprises a number of turns (twists or twines) per unit length and must be wound on the winding element 5 in several windings.

Referring to Figs. 3a, 3c, 3d, and in more detail to Fig. 3f, the elongate, threadlike element is carried to a guide element 17 via a number of guide wheels 19 before the elongate, threadlike element is received in the winding groove of the guide roller 16 for the purpose of being wound on the winding element 5.

The elongate, threadlike element thus runs from the last guide wheel 19, over a guide disc 39a of a yarn slackener in the direction of an eye 19' bent into a pigtail shape. The guide disc 39a is provided with a groove (e.g. a flat groove or a V-shaped groove) for receiving the elongate, threadlike element and is driven by a rotary shaft (not shown) via a magnetic coupling (not shown). Said magnetic coupling operates according to the eddy current principle. Said shaft is carried through the yarn slackener 39 and is driven by the twisting shaft 7 via the gear transmission 24, 25, 26 and the first gear transmission 21, 22, 23.

The guide disc 39a rotates in the direction of transport of the elongate, threadlike element. As a result of the use of a suitably selected transmission ratio of the aforesaid gear transmissions and of the magnetic coupling, the velocity of the rotating guide disc 39a is higher than the velocity with which the elongate, threadlike element is carried through the device. This enables the yarn slackener 39 to reduce any stretch that may be present in the elongate, threadlike element. Because of this, the hardness of the bobbin is maintained at a constant level. A very high yarn tension during the winding process leads to a hard bobbin.

The guide roller 16 (see Figs. 3b and 3f) is provided with a helical winding groove extending over the outer surface thereof, which groove functions to ensure that the elongate, threadlike element is

evenly wound over the full length of the winding element 5.

The drive means comprise a driving roller 15, which can be placed into abutment with the winding element 5, for winding the elongate, threadlike element on the winding element 5. The force with which the driving roller 15 presses against the winding element and the windings 8 (see Figs. 2, 3b, 3c, 3e) is adjustable, for example by means of the gas spring or tension spring 20.

The driving roller 15, the guide roller 16 as well as the guide element 17 are mounted on a second supporting arm 18b, which supporting arm 18b is pivotally connected to a first supporting arm 18a. As already noted above, the supporting arm 18a is mounted in bearings 29 on the first end 7a of the twisting shaft 7.

The construction consisting of the support 18 (the first support 18a and the second support 18b) together with the driving roller 15, the guide roller 16 and the guide element 17, is mounted in the frame 10 in a free-floating manner. The winding shaft 6 can be mounted on the first supporting shaft 18, which functions as a semi-fixed structure, via the flange 35. To that end, the first supporting shaft 18a is provided with a number of fixing openings 37, which function to receive fixing pins 36 for connecting the winding shaft 6 to the first supporting arm 18a. As Figs. 5a and 5b clearly show, the winding element 5 is mounted in bearings 30 on the winding shaft 6.

The driving of the driving roller 15 and the guide roller 16 for the purpose of winding the elongate, threadlike element on the winding element 5 takes place as follows. The first end 7a of the twisting shaft 7 is provided with circumferential teeth 21 near the twisting arm 11 (see Figs. 3b, 3d, 3f, 5a and 5b), over which a geared belt 23 is passed for driving a first gear 22 that is mounted on the first supporting arm 18a.

A geared belt is driven via several gear transmissions (see Fig. 3e), which geared belt 28 drives the driving roller gear 15a and the

guide roller gear 16a (see Figs. 3b, 3c, 3e) for rotating the driving roller 15 and the guide roller 16, respectively. As a result of the adjustable hold-down force (exerted by the gas spring 20), the driving roller 15 is thus pressed against the winding element 5 (and the windings 8 already present on the winding element) for rotating the winding element 5 on the bearings 30 (see Figs. 5a and 5b).

The driving roller 15 pulls the elongate, threadlike element through the device. The elongate, threadlike element is introduced into the frame 10 via the inlet opening 3 and carried in the direction of the twisting arm 11, to which arm a circular movement in the frame 10 is imparted by the rotary twisting shaft 7, carrying along the elongate, threadlike element over the guide ring 38a (38b). Said circular movement of the twisting arm 11 makes a first contribution towards imparting a number of turns (twists or twines) per unit length to the elongate, threadlike element.

The threadlike element is passed through the guide eye 12, after which it is carried through the bore 32 via the feed-through channel 13 and the right-angled bore portion 32a. The elongate, threadlike element exits the bore 32 via the right-angled winding shaft bore 33 and the outlet opening 34. Because the outlet opening 34 forms part of the semi-fixed structure (consisting of the winding shaft 6 with the flange 35, the first supporting arm 18a and the second supporting arm 18b), which does not rotate along, the rotating twisting shaft 7 again imparts turns (twists or twines) to the elongate, threadlike element in the bore 32.

After the twisted, elongate, threadlike element has exited the outlet opening 34, it is carried over a number of guide wheels 19 before being wound on the winding element 5 by the driving roller 15 via a guide element 17 and the guide groove 16b of the guide roller 16.

As Fig. 3d clearly shows, the guide ring 38a is mounted on the first supporting arm 18a. To protect the balloon of the elongate,

threadlike element being created by the twisting arm 11 additionally against catching, a second guide ring 38b may be used, over which the elongate, threadlike element can be passed before the elongate, threadlike element is carried in the direction of the twisting shaft 7 via the guide eye 12 and the feed-through channel 13. The use of a second guide ring 38b leads to a considerably improved operation of the device, because the elongate, threadlike element is prevented from getting entangled in the driving construction (the rotating parts) when a brief instability occurs in the balloon.

To prevent abrasion of the threadlike element, the guide eye 12 and/or the feed-through channel 13 may be provided with a material of enhanced hardness. More in particular, the guide eye 12 and the feed-through channel 13 may be provided with ceramic contact surfaces. The feed-through channel 13 is configured as a slot in Fig. 4, but it may also be configured as a through-bore in the twisting arm 11.

Figs. 7a and the 7b show another aspect of the device according to the invention. In this case, the device is provided with brake means 40 near the inlet opening 3, which function to carry the elongate, threadlike element towards the winding/twisting unit via the inlet opening 3 with a certain amount of internal stretched tension.

The brake means 40 are arranged on a supporting plate 46, which is mounted on the supporting beam 4a. The brake means 40 comprise a first brake unit built up of three braking wheels 41, 42, 43. The braking wheels 41 and 43 are rotatably connected to the supporting plate 46 about a fixed pin, and the third braking wheel 42 is movably provided in a slot 46a formed in the supporting plate 46. The position of the braking wheels 42 in the slot 46a is adjustable, so that a certain internal yarn tension is imparted to the elongate, threadlike element as it is passed over the guide wheels 41, 42 and 43.

The tension in the elongate, threadlike element is very important for the quality of the final twisted and wound elongate,

threadlike element and for the operation of the winding/twisting device. The braking action provided by the braking wheels 41, 42, 43 on the elongate, threadlike elements moving past is more or less constant.

The brake means 40 furthermore comprise a second brake unit, which is built up of two rotatable reel elements 44-45 disposed one above the other, each reel element 44-45 being provided with a groove 44'-45' formed in the circumferential surface. Also refer to Fig. 7b.

The elongate, threadlike element is guided from the first brake unit 41-42-43 into the parallel grooves 44'-45' of the two reel elements 44-45 in several windings before being introduced into the device through the inlet opening 3. Preferably, one of the reel elements, more in particular the reel element 44, is freely rotatable on a shaft 44a that is mounted on the supporting plate 46, whilst the other reel element 45 is likewise rotatable on a shaft 45a, but in this case the rotation of the reel element 45 is braked by a magnetic brake 51.

This in contrast to the reel element 44, which can freely rotate about its shaft 44a. The magnetic brake 51, which operates according to the eddy current principle, decelerates the elongate, threadlike element present in windings in the grooves 45'-44' as it runs off the reel element 45 in the direction of the inlet opening 3, resulting in an adjustable internal yarn tension.

The brake may also be configured as a speed-dependent hysteresis brake, i.e. the braking action depends on the number of revolutions of the device. The higher the number of revolutions, the greater the braking action of the brake 51 on the elongate, threadlike element moving past. In this way a more stable balloon is obtained over the entire speed range of the device. The offset and the magnitude of the braking action are adjustable.

Fig. 8 shows yet another embodiment of the twisting shaft 7a. In this figure, the bore 32 through the twisting shaft 7a is provided with friction-reducing means, in this embodiment in the form of ceramic

rings 61a-61b, which function as guide surfaces for the elongate, threadlike element moving past. Furthermore, ceramic guide rings 60a-60b are arranged near the transition 32a between the feed-through channel 13 in the twisting arm 11 and the bore 32 on the one hand and near the transition 32b between the bore 7a and the winding bore 34 on the other hand. This prevents abrasion and possible fracture of the elongate, threadlike element.

It will be understood that by using this construction a sophisticated winding device is obtained, which, and as a result of the combination of twisting means and winding means a simplified and compact device capable of twisting (or twining) as well as winding is obtained.

The number of turns (twists or twines) per unit length in the elongate, threadlike element depends not only on the rotational speed of the twisting arm 11 and the twisting shaft 7 but also on the winding speed as imparted by the driving roller 15. In principle, the rotational speed of the twisting arm 11 and the twisting shaft 7 is directly determined by the rotational speed of the twisting shaft 7 as imparted thereto by the drive means 2. The velocity at which the elongate, threadlike element is carried through the device according to the invention is determined by the rotational speed of the driving roller 15, which is determined by selecting the correct transmission ratio is for the geared belt. The winding device according to the invention makes it possible to impart 35 +/- 2 S- or Z-turns (twists or twines) per linear metre to the elongate, threadlike element.

However, the number of S- or Z-turns (twists or twines) in the elongate, threadlike element can be adjusted at will during winding when using the device according to the present invention.

The combination of twisting/twining and winding in one device makes it possible to increase the production rate of twisted or twined yarn or synthetic fibre considerably, which leads to a significant improvement as regards the productivity and production capacity, but also

as regards the pay-off period.

The number of turns (S- or Z-twists or twines) and the speed at which winding takes place are not interdependent.